Assignment #2

Due Friday, 13 September 2024, at the start of class

This Assignment is based on Chapter 4 of the textbook,[1] especially sections 4.1–4.4. While bisection may be new to you, I claim you were introduced to Taylor's theorem and Newton's method in calculus. Nonetheless, read these things carefully here.

Remember that when you turn in homework problems involving MATLAB (or language of your choice), the following two expectations will always apply:

1. The commands that you used must be shown, along with the results.
2. Please strive to minimize use of paper: edit your result to remove extra space *but* keep a clear distinction between your m-files, your input commands, and the computed results and/or figures.

Do the following exercises from the textbook:

CHAPTER 4

- Exercise 1 on page 102. (*Hint for (d): See section 4.4.*)
- Exercise 2(a) on page 102. (*Start by plotting the function as requested. Then write your code. Please fully understand how bisection is programmed, even if you play with the book's code!*)
- Exercise 3 on page 103. (*You do not need to answer the last sentence, starting "For positive R, use the theory of fixed point ..." We will worry about that on the next assignment.*)
- Exercise 4 on page 103.
- Exercise 6 on page 103.
- Exercise 7 on page 103.

Do the following additional problems:

P1. Consider applying bisection to $f(x) = x^2 - 2$, using an initial bracket $[1, 2]$, to approximate $\sqrt{2}$ to within 10^{-2}. Calculate in advance how many steps are needed. Now run the algorithm *by hand* for that many steps, reporting each bracket. (*You won't even need a calculator. In any case, don't run a* MATLAB *program.*)

[1] Greenbaum & Chartier, *Numerical Methods: Design, Analysis, and Computer Implementation of Algorithms*, Princeton University Press 2012).